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THE HISTORY OF OIL AND GAS CONSERVATION LEGISLATION IN ARKANSAS

Phillip Norvell

The History of Oil and Gas Conservation Legislation in Arkansas

I. Introduction

2014 is the 75th anniversary of the enactment of the Arkansas Conservation Act, Act 105 of 1939, that imposed a scheme of state regulation on oil and gas production to avoid waste and protect correlative rights. The Act created the Arkansas Oil and Gas Commission to administer and enforce the regulatory scheme. The purpose of this article is to provide a narrative of the history of the enactment of Act 105 of 1939. The background of the Act, the Rule of Capture and the prodigious economic and physical waste that it yielded will be examined, along with early conservation attempts in the producing states to stem the vast tide of waste. The early Arkansas experience with waste and the ineffectual legislation attempts to solve the matter will be explored, including the pivotal events in the Rodessa and Shuler fields that were the catalysis for the enactment of Act 105. An analysis of the major substantive provisions of Act 105 will be undertaken, including the shortcomings of the initial Act and the subsequent legislative amendments that forged the Act into an effective comprehensive scheme of state regulation that conserves valuable oil and gas resources.

II. The Common Law Background of Unregulated Production

a. The Rule of Capture

Oil and gas in its natural state, unlike hard minerals, is a fluid or vapor. It is fugacious and will migrate across boundary lines within the subsurface reservoir. It is susceptible to drainage from off-tract wells. The migratory character of oil and gas has proved to be its defining physical characteristic. It led to the venerable rule of capture¹ which permitted landowners the unrestricted right to drill and produce from wells located on-tract without incurring liability for off-tract drainage. An early oil and gas practitioner and commentator on the oil and gas conservation movement summed up the rule as "the owner of a tract of land acquires title to the oil and gas which he produces from wells drilled thereon, though it may be proved that part of such oil or gas migrated from adjoining lands."² The remedy for the hapless landowner being drained by his adjoining neighbor's

well was "Go and do thou likewise"³, i.e., drill an offset protection well, the "evil twin" of the rule of capture.

The adoption of the rule of capture for oil and gas was premised on the lack of scientific knowledge of the behavior of producing reservoirs that existed during the embryonic days of the industry.⁴ It was known that oil and gas would migrate across surface boundary lines when produced but the technology did not exist to ascertain the source of the production within the reservoir. Consequently, early courts analogized to the common law of percolating waters (groundwater) and the law of obtaining possession to wild animals, both of which applied the rule of capture. Regardless of whether the analogies to percolating waters or wild animals were appropriate or not, applying the rule of capture to oil and gas production occasioned much waste of oil and gas development costs and reserves. The early proponents of oil and gas conservation legislation believed the judicial adoption of the rule of capture to be an exercise in ignorance.⁵ Professor Maurice Merrill, an early oil and gas scholar, writing in the early 1960's, observed that a state court adopting the rule of capture did about as well as could be expected due to the then state of the knowledge as to reservoir mechanics.⁶ Despite the evils associated with the rule of capture, it was not without its virtue. The modern justification for the rule is that it rewards those who exercise diligence and take the risk in drilling oil and gas wells.⁷ The rule encourages development of oil and gas reserves.

b. Waste

The rule of capture as the cornerstone of unregulated production occasioned much mischief. Because oil and gas is produced from subsurface reservoirs which may, and frequently do, underlay numerous separately owned tracts, the rule of capture simply mandated the classic "common pool exploitation"⁸ of the reservoir in which each tract owner, to ensure its maximum recovery from the reservoir, was encouraged to drill as many wells and produce as much oil and gas from the "common pool," as fast as possible. The consequences of the rule of capture was enormous physical waste including both surface and underground, as well as economic waste.⁹

Surface waste involves loss of oil at the surface resulting from spillage, evaporation and overflows from earthen surface storage pits or open oil tanks and leaks from production and transportation equipment. Land was also wasted as numerous wells meant excessive surface usage for drilling, producing operations

and transportation of the production. Economic waste was also rampant in that unnecessary investment was expended in the drilling and operation of needless wells. For example, in 1965 the East Texas field had an estimated 17,200 wells and one expert opined that it could have been efficiently and effectively drained by 1500 wells.¹⁰

The rule of capture also led to underground waste. Underground waste occurs when oil and gas in the reservoir that could have been produced will be left behind because of wasteful and inefficient operation of the well or wells. Production that impairs the reservoirs natural energy mechanism that facilitates efficient recovery is one source of underground waste. Oil and gas reservoirs are distinctly unique as to the reservoir pressure mechanism that effectuates production.¹¹ Gas-cap drives, dissolved-gas drives, water-drives and any combinations of the three may characterize oil and gas reservoirs. In a gas-cap drive reservoir, the gas, which is lighter than oil, is on top of the oil zone. As the oil is produced, the gas expands to displace the oil and increases the reservoir pressure to drive the oil to the well bore and assists in the lift to the surface. In a dissolved-gas reservoir the gas is dissolved in the oil and as the oil is produced the dissolved gas in the oil expands to increase the reservoir pressure and likewise facilitate production. In a water-drive reservoir, which are known for their potential for high rates of ultimate recovery from the reservoir, the oil is top of the water and as the oil is produced, the water expands and enhances the reservoir pressure and facilitates production.

Oil wells that produce high ratios of gas to oil in gas drive reservoirs or high ratios of water to oil in water drive reservoirs may unduly dissipate the reservoir pressure and their production should be limited if not restrained. A uniform rate of production is necessary to avoid wasted reservoir energy, and irregular and non-uniform migration of fluids that may by-pass large deposits of oil or gas that will be left behind in the reservoir and may result in premature abandonment of the field. The oil-water contact line or the gas-oil contact line needs to move uniformly through out the reservoir as the oil is produced to avoid "channeling" or "coning" that traps or by-passes oil or gas in the reservoir that may never be recovered.

Underground waste, like surface and economic waste, was rampant under unregulated production and the rule of capture.¹² Excessive number of wells draining the reservoir without regard to either the oil/gas ratios or oil/water ratios, characterized production in the early years of the 20th century. Wide open flow of

wells, the practice of the early operators whose vocabulary did not contain the word "choke", exacerbated the problem. Likewise, the practice of venting or flaring the gas was monstrously wasteful of oil and gas reserves. In the early days of the industry, there was no market for gas and it was viewed as a worthless by-product of oil production. More over, a general belief existed that if a well initially produced only gas, the well had to be "blown out", to deplete the gas in the reservoir before the well would produce oil.¹³ Tremendous physical waste, much of it underground, was experienced.

The perils of underground waste were not early known. Unlike surface spills or evaporation of oil from surface pits, underground waste couldn't be observed. Bottom hole pressure tests that could lead to the obvious conclusion that declining production was related to declining pressure only became prevalent in the late 1920's. Petroleum engineering, the science of reservoir performance, was in a nascent state of development. However, an awareness of reservoir characteristics and behavior and prudent management to avoid physical and economic waste was developing.

c. The Doctrine of Correlative Rights

The common law doctrine of correlative rights¹⁴ developed parallel with the evolution of the science of underground waste. The doctrine is premised on the recognition that mineral owners to tracts that overly the reservoir share "reciprocal rights and duties in the common source of supply."¹⁵ Each landowner has the right to produce his fair share of the common source of supply and the duty not to negligently or intentionally injure the common source of supply. Negligent¹⁶ or intentional¹⁷ spoilation of the common source of supply incurs liability. Likewise, the defendant's surreptitious production in excess of his well allowable established by the conservation agency's Proration Order that resulted in drainage from the plaintiff's adjacent production unit incurred liability for breach of the correlative rights doctrine.¹

Described as an exception to the non-liability for drainage feature of the rule of capture,¹⁹ the correlative rights doctrine is based on the necessity of maintaining and utilizing reservoir pressure to obtain maximum ultimate recovery from the common source of supply. The doctrine is a recognition that the landowner's property interest is not merely in the oil and gas in that portion of the common source of supply that underlies his tract but extends to the right to "make use of the expulsive forces which constitute the reservoir energy."²⁰ The reservoir energy, like the oil and gas, constitute a

common source of supply.²¹ Stated another way, the oil and gas and the reservoir energy are a "package" that comprise the landowner's property interest in the oil and gas estate.

The emergence and acceptance of the doctrine of correlative rights premised that comprehensive oil and gas conservation acts, when adopted, would serve dual purposes: the prevention of waste and the protection of correlative rights. These two objectives, it has been observed, are "coequals, each worthy of pursuit in its own right, one for the sake of what may be called *economy*, the other for the sake of *equity*."²² Others, however, have opined that in the event of a conflict between the prevention of waste and protection of property rights under the correlative rights doctrine under conservation acts, the former prevails.²³

III. The Early Conservation Acts

The depressed price for crude oil was the paramount problem of the industry during the era of unregulated production and the rule of capture. The race to drill as many wells and produce as much oil as possible yielded production in excess of the demand for oil and the transportation facilities in the field. Precipitous declines in the price of crude were experienced. The goal of the industry was state control of production so that the problem of surplus capacity could be eliminated. The rule of capture was the target for reform under the guise of conservation, including the prevention of economic and physical waste, but the primary objective was market stabilization.²⁴ Though it was inevitable that the attempt to limit the supply of crude, and raise its price, as an objective of conservation, would prove controversial, the effect of the relationship of "distressed crude oil" to physical waste was real:

"The inevitable result of the rule of capture's complete lack of legal restraint has been to force producers into one drilling race after another, in which each sought to drill as many wells as possible, as quickly as possible, in order to capture for himself the lion's share of the spoils. Nearly every discovery of an important oil field brought a mad rush of drilling that often produced more oil than the market could absorb. Whenever this occurred, the unhappy operator who could not find a buyer for his oil nevertheless continued to produce his wells rather than have his more fortunate neighbors drain oil from his lands. In field after field, with no other facilities available, this surplus oil was "stored" in pits dug out of raw earth, and even in open ditches; appalling quantities of oil were lost through evaporation and seepage, surface and underground waters were polluted, and serious fire hazards created, sometimes with disastrous results."²⁵

a. Prorationing

Prorationing is the obvious remedy for dealing with the problem of "distressed oil." In market demand prorationing, the state conservation agency restricts statewide production to the estimated market demand and then allocates the state total back to either fields or reservoirs and then to individual wells.²⁶ Thus, each producing well is assigned an "allowable." The intended effect is to accumulatively reduce the state's production to equal the market demand. The first proration statute was a market demand statute and was enacted in Oklahoma in 1915 after discovery of the huge Healdton and Cushing fields whose production glutted an already saturated market with oil far in excess of market demand.²⁷ The Act defined waste to include "production in excess of marketing or transpotation facilities or reasonable market demand"²⁸ and authorized the Corporation Commission to prorate production from any common source of supply to avoid such waste.²⁹ Texas passed a similar market demand proration statute in 1919.³⁰

Prorationing can also operate to limit the production from wells in the reservoir to a rate of production that avoids physical waste without out regard to the market for the production. Rapid and indiscriminate rates of production may dissipate reservoir pressure and cause underground waste of oil reserves. Parallel with the development of the theory of underground waste was the theory of the Maximum Efficient Rate of production (MER) that maintains reservoir pressure and yields ultimate maximum recovery of oil. The MER has been defined as the as the "highest sustainable rate at which a field can be produced for a designated period without appreciable loss in ultimate oil recovery."³¹ MER likely does not entail one rate of production that will yield maximum ultimate recovery but a *range* of production rates that attain efficient operation and maximum recovery over the life of the well.³²

Market demand proration and MER prorationing could have been jointly administered in a state's prorationing scheme. Under such a scheme, an allowable under market demand prorationing for a well could not be greater than the allowable for that well under MER prorationing. An allowable in excess of the MER allowable would permit an inefficient rate of production that may cause underground waste. If the market demand allowable is below the MER allowable, than the market demand allowable is operative. However, joint administration of MER and market demand prorationing may not have been the general practice.³³

Despite its controversy, market demand prorationing continued until the early 1970's when the market changed and the demand for oil eclipsed the market supply of oil. Today, market demand prorationing is only of historical interest. However, some states still maintain the statutory framework that would permit implementation of market demand prorationing when supply exceeds demand.

b. Ratable Taking

Market demand or MER prorationing may result in physical waste unless oil is purchased ratably from each well producing in the common source of supply. Ratable taking requires each purchaser to spread out the amount of its purchase from the reservoir equally between each producing well. Otherwise, some wells in the reservoir may produce more, while other wells produce less, or none, resulting in an imbalance in production within the reservoir that may create a non-uniform oil-water or gas-oil contact line and trap or by-pass oil that may be left behind. Additionally, in the absence of ratable taking, the producing tracts may drain the non-producing tracts in violation of the doctrine of correlative rights. The statutory remedy was typically a ratable take statute, sometimes referred to as a common purchaser statute, that required a purchaser to take ratably from all wells in the field. Oklahoma enacted the first ratable take statute, applying only to gas, in 1913.³⁴

c. Well Spacing Acts

Well spacing acts were also central to the control of production and the abatement of the enormous economic and physical waste that followed the rule of capture. Such acts limit the number and location of wells that can be drilled in a reservoir to eliminate unnecessary wells and their cumulative excessive rates of production. Relying on its general statutory authority to make rules and regulations to prevent waste of oil and gas, the Texas Railroad Commission (TRC) promulgated Rule 37, the Texas well spacing regulation, was promulgated in 1919.³⁵ Rule 37 simply prohibited the drilling of a well nearer than 300' to any other wells or nearer than 150' to any property line. This basically established a spacing pattern that prohibited drilling on a tract of less than two (2) acres. However, exception wells were expressly permitted to prevent waste and protect correlative rights. Rule 37 was much amended as the spacing patterns were enlarged.

d. Forced Integration (Compulsory Pooling)

Pooling is complementary to the establishment and operation of spacing or drilling units under well-spacing Acts. Because the area encompassed by the drilling unit is limited to one (1) well for the common source of supply, some legal mechanism is needed to merge or pool the separately owned tracts situated within the unit so that they constitute one (1) tract for well-spacing purposes. Voluntary pooling achieves that result. Oil and gas leases typically contain pooling clauses³⁶ that expressly permit the lessee to pool the tract with other tracts for purposes of satisfying the well-spacing requirements. Thus, the lessees and any unleased mineral owners of the separately owned tracts situated in the drilling unit may agree on a plan of development for the drilling and operation of the unit well and voluntarily pool their interests. Voluntary pooling has the

legal effect of integrating the separately owned tracts within the drilling unit so that they are treated as one tract for purposes of oil and gas development. Consequently, production from a well anywhere on the unit satisfies the habendum clause's secondary term requirement of production, regardless of the location of the unit well.³⁷ Likewise, voluntary pooling appoitions royalty on a surface-acreage basis.³⁸

Forced integration is necessary to permit development of a drilling unit when the working interest owners and unleased mineral owners fail to agree to the plan of development and voluntary pooling. Courts refused to judicially effectuate pooling, known as "equitable pooling," to permit the developing paitiy in the drilling unit to drill a unit well when non-consenting working interest owners refused to voluntarily pool.¹⁹ Thus, development of the drilling unit could be thwarted by non-consenting unit interests in the absence of state compulsion provided by forced integration. Forced integration statutes typically have the legal effect of integrating the separately owned tracts within the drilling unit so that they are treated as one tract for purposes of oil and gas development. Likewise, conservation acts typically mandates that production from a well anywhere on the unit satisfies the habendum clause's secondary term requirement of production⁴⁰ and also appoition royalty on a surface-acreage basis.⁴¹

e. Unitization

Unitization of oil and gas reservoirs involves integrating or unitizing the common source of supply to permit its development and operation as a single unit.⁴² Unitization involves the process of conveling the leasehold and mineral interest in each individual tract or production unit into an interest in the unitized area that permits operations without regard to the surface propeliy lines. The geologic characteristics of the reservoir and principles of reservoir engineering determine the optimum number and location of wells, the MER rate of production, and avoidance of wells yielding higher than optimal ratios of gas or water to oil.

In the early 1920's, Henry L. Doherty,⁴³ the CEO of Cities Service Oil Co., championed a federal statute to compel unitization for the development and operation of all oil and gas reservoirs. In the midst of prodigious waste of oil and gas reserves, Doheiiy believed that the crude oil producers would never abandon unregulated production or that the producing states would adopt effective conservation laws. Under D0he1iy's plan, federal fieldwide unitization would obviate the need for well-spacing, prorationing and ratable take statutes. The industry's attitude was that "there was no evil then known which was so great as to justify federal control or regulation"⁴⁴ of oil and gas production. Though D0he1iy was a prominent voice for reform, he proved to be no prophet for federal unitization.

Unitization can be accomplished by voluntary unitization or compulsory unitization pursuant to state conservation acts. Voluntary unitization involves the agreement of the working interests and mineral interests in all or a part of the reservoir to undertake joint operations to develop the unit or engage in an enhanced recovery operation.⁴⁵ Unitization involves a plan of development or enhanced recovery that will entail an analysis of the engineering and economics for the proposed project. If the plan of operation is proposed, a tract participation formula is developed that will allocate the production as well as the costs for the unit. Unlike pooling which allocates production and cost for the pooled unit on a surface acreage basis, unitization allocates production and costs for the separately owned tracts or production units on their potential for oil productivity from the unit. Thus, the unit participation formula for each tract may be based on a combination of factors, such as tract acreage, net acre feet of pay and volume of oil in place, differences in porosity in the field, current and cumulative production and projection of recovery from each well.⁴⁶ Forming a unitization project is a lengthy and involved process.

Unitization in the early days was a hard sell.⁴⁷ Some working interest or mineral owners won't like the participation formula. Some believe they would fare better on their own independent leasehold operation. Fears of excessive costs of unit operations may exist. During the 1940's, oil and gas producers lacked experience in evaluating a unit interest in exchange for an interest in a wholly owned lease.⁴⁸ Compulsory unitization is required, or should be required, as a remedy for the minority non-consenting interests whose refusal to execute the unitization agreement impedes voluntary unitization. Louisiana is reputed to have adopted the first compulsory unitization statute but it was limited to gas recycling operations. Oklahoma's original compulsory unitization statute⁴⁹ was enacted in 1945.

(4) The 1930's: Distressed Oil and the Interstate Oil Compact

The discovery of the Oklahoma City field and the East Texas field in the early 1930's flooded an already depressed market with distressed crude.⁵⁰ The price of crude oil fell to 10 cents a barrel. The price of Arkansas crude fell to 10 cents a barrel in 1933. In 1930-31, the state national guard was called out in both Texas and Oklahoma to close the Oklahoma City and East Texas fields to prevent further physical waste of oil and gas. The problem was so severe that oil and gas producing states began to consider an interstate compact that would authorize collective state action to deal with the problems of waste and excess market demand. Avoiding legislation by congress that would impose federal regulation of oil and gas conservation was the impetus for the formation of the Interstate Oil Compact (IOC).

The driving force for the creation of the Interstate Oil Compact (IOC) was to establish a compulsory system of state market demand proration to stabilize the price of

oil. Ultimately, the creation of an IOC as a supra-governmental entity that could compel states to enact and enforce particular oil and gas conservation schemes failed. The IOC was approved by Congress in 1935 and operates solely in an education and advisory capacity that accumulates information on oil and gas conservation, assists member states in enacting sound oil and gas conservation laws and educates the public on the importance of the conservation of oil and gas resources. The Interstate Oil Compact Commission (IOCC), the governing body of the IOC, was most successful in disseminating the theory of physical and economic waste resulting from unregulated production and encouraging the prorationing and well-spacing. The arrival of the IOCC on the scene with its educational mission for oil and gas conservation signifies that knowledge of the science of oil and gas reservoirs and prudent reservoir management to avoid underground waste was well-known.

Consequently, the 1930's were the era of the impoliant oil and gas conservation acts. Oklahoma adopted a comprehensive conservation act in 1933, Louisiana and New Mexico adopted conservation acts 1935. Admittedly, comprehensive state conservation acts that dealt adequately with waste of valuable natural resources were late in coming. As early as 1925, the industry had generally known that their time honored methods of production were inefficient.⁵¹ Ignorance of the prodigious underground waste that occurred from premature dissipation of the reservoir pressure had long cease to be an excuse for inefficient production practices. Unwillingness to submit to governmental regulation and resistance to change proved to be difficult obstacles to overcome in the battle for adequate comprehensive conservation regulation. As noted by Robeli E. Hardwicke, one of the early pioneers of oil and gas conservation observed:

Undoubtedly, the great majority of oil men of that time were skeptical as to the advisability of abandoning long and established view points and practices (drill and produce according to your own ideas of efficiency and economics; drain oil from neighboring lands and protect your own land against adverse drainage as best you can).⁵²

Additionally, the period ushered in a system of market demand proration that lasted until the early 1970's when domestic supply changed from supply in excess of demand to demand in excess of supply. At that time, market demand proration dropped out of the system and MER prorationing reigned supreme.

IV. Waste and Conservation Legislation in Arkansas

a. Physical Waste in Arkansas

The rule of capture was not benign in Arkansas. The history of oil and gas production in the State is replete with examples of excessive well density, undue surface waste and physical waste of oil and gas. W. Henry Rector, author of a tract on the history of Arkansas' early Oil and Gas Conservation laws,⁵³ summed up the waste of oil and gas that occurred in the El Dorado and Smackover fields, discovered in 1921 and 1922, respectively:

"The manner in which the El Dorado and Smackover fields were operated is a disgrace to the industry. Millions of barrels of oil were allowed to escape, polluting the waters of Smackover Creek and thereafter the Ouachita River. The conservation of gas produced with the oil was unheard of, billions of cubic feet being allowed to go to waste. The excuse was that the wells were oil wells; that the gas was merely incidental; that oil could not be lifted without liberating the gas, and that as the production of oil was the supreme object of the operators, they could not be concerned with the gas. Only a small portion of the gas produced was devoted to utilitarian purposes. Oil wells and gas wells producing richly gas would sometimes catch fire and be allowed to burn for weeks at a time. Great craters formed in portions of Smackover field and raging infernos consumed billions of feet of gas, creating conflagrations that could be seen for fifty miles."⁵⁴

b. Act 166 of 1917

Arkansas attempts to conserve oil and gas by legislation began early and dealt with distinct problems of waste. The first legislative act was Act 166, Session Acts of 1917,⁵⁵ that dealt with shallow gas production in the early gas fields in Sebastian County. The Act required, *inter alia*, the confinement of water formations in the drilling of the wells to avoid flooding the productive reservoir,⁵⁶ mandated plugging of abandoned oil and gas wells,⁵⁷ prohibited the long term venting of gas⁵⁸, and limited the production of gas to not in excess of 20%⁵⁹ of the open hole capacity of the well. The latter requirement was likely to prevent loss of "back pressure" to prevent water encroachment on the producing formation from underlying formations of water.⁶⁰ The Act was to be enforced by an Inspector of Gas,⁶¹ appointed by the Governor, and assessment of fines for violations.⁶²

c. Act 664 of 1923

The discovery of the Smackover oil field in 1922 led to a 1923 statute that expanded the prohibition on waste.⁶³ Although entitled an "Act to conserve crude oil or petroleum and natural gas," the emphasis on the prevention of waste was on gas production. The act mandated that all pipeline companies, gas distributors, oil and gas drilling and producing operators prevent all waste of oil and gas in their respective operations, including leakage and spillage from their equipment and facilities, as well as production in "any manner or under any such conditions as to constitute waste."⁶⁴ Such waste was specifically defined as the emitting or flaring of natural gas, drowning a commercial gas stratum with water, underground waste, and the wasteful utilization of gas.⁶⁵ The Act expressly prohibit gas in the reservoir from being used to flow the oil to the surface when the gas could be "separated" from the oil production.⁶⁶ Other than surface waste, the only waste of oil forbidden was underground waste which was not specifically defined. In lieu of a market demand proration scheme for gas, the act provided that when the reservoir production exceeded the market demand, a producer could only take his proportionate share of the natural flow that could be marketed without waste.⁶⁷ The Act also imposed a "a common purchaser and ratable take" scheme for the purchase of gas production.⁶⁸

Conspicuously absent from the Act was the lack of regulation on oil production. The act imposed no well-spacing, unitization, market demand prorationing or ratable take obligations on oil production. The Smackover Field was developed under the rule of capture with the physical and economic waste associated with its legions of unnecessary wells. The Act did vest the Arkansas Railroad Commission, succeeded by the Board of Conservation (Board) in 1927,⁶⁹ with the authority to administer the Act and promulgate all necessary rules and regulations to conserve oil or gas including the imposition of further control over the production of oil or gas.⁷⁰ Arguably, the Arkansas Railroad Commission had the authority to implement controls on production by rule making. No such administrative regulations were enacted.

Smackover Field appears to be comprised of associated oil and gas reservoirs. Gas was a waste product in 1923, without a market, and wanton venting or flaring of the gas was the rule of the day. In addition to the gas being wasted, dissipation of the reservoir pressure by venting and flaring the gas was causing underground waste of oil. The Board had the authority to enforce the Act's prohibitions against venting or flaring gas. However, enforcing the Act's prohibition of venting and flaring gas would have limited, if not prohibited oil production, the only play in the field. Needless to say, the Act was never enforced. The explanation offered for the lack of enforcement is that the State legislature levied a severance tax of 2 % of market value on oil and gas a month before the enactment of the Conservation measure.⁷¹ Enforcing the Act to prevent the

waste of gas would have greatly reduced the flush oil production, decreasing the oil severance revenues that were filling the coffers of the state's treasury, as well as the operators.⁷²

d. Act 234 of 1933

The state legislature primarily re-enacted the substantive provisions of the 1923 Conservation Act as Act 234 of 1933.⁷³ The Arkansas Board of Conservation was created to administer the Act. The five (5) member Board were to be "experienced in and having a fair knowledge of the oil and gas industry."⁷⁴ The waste of oil and gas as defined and proscribed in the 1933 Act were identical to the provisions of the 1923 Act.⁷⁵ The common purchaser and ratable take and market demand proration provisions for gas were also identical.⁷⁶ The Board of Conservation was authorized to promulgate rules and regulations.⁷⁷ Ominously, however, the Board's authority to impose further administrative control over oil and gas production by rule making was excluded by the 1933 Act.

1. The Rodessa Field

1937 was a lamentable year for Act 234 and the Board of Conservation. The Rodessa Field, discovered in 1935, spanned from Jefferson, Texas to Caddo Parish in Louisiana, was extended into south Miller County, Arkansas by a discovery well in June of 1937. The Rodessa Field was the most important oil and gas discovery in Arkansas since 1925. The discovery well indicated that the reservoir had a large gas cap and to attain optimum recovery from the reservoir production of gas should be minimized.⁷⁸ Both Louisiana and Texas regulated the production in their respective share of the tri-state field by well-spacing and prorationing regulations. The Board of Conservation was largely dormant in Arkansas at the time of the Rodessa Field discovery because of the lack of funding.⁷⁹ The Board only had two employees, a field man and a stenographer.⁸⁰ There was no geologist or petroleum engineer employed by the Board. The agency was not adequately staffed or funded to deal with the challenge of the Rodessa Field. Moreover, Act 234 was inadequate to address the issues of waste and the protection of correlative rights.⁸¹ Nevertheless, with 10 wells having been completed in the field, the Board issued an Order that dictated a scheme of well spacing and prorationing for the Arkansas field consistent with the Texas and Louisiana regulations.⁸² A hue and cry against the Order was raised by furious landowners, operators and royalty owners and the local press. Mass meetings of protests were held and the governor was implored to intervene and seek the lifting of the Order by the Board.⁸³ Three days before the Order was to be effective, it was enjoined by a Miller County court in an action brought by a local operator. One argument advanced by the operator before the local court was that market demand prorationing had nothing to do with physical waste and everything to do with price fixing.⁸⁴

The state court injunction allowed continuation of the unrestrained production that lasted for approximately one year. During that period the Rodessa Field in Arkansas lost 76% of its reservoir pressure while Louisiana and Texas lost 34% and 18% of their respective reservoir pressure.⁸⁵ The loss of pressure was a result of excessive and non-ratable flow rates from the wells and the dense well-spacing.⁸⁶ It is estimated in 1938 that the Arkansas portion of the field produced \$7 million in oil but that the underground waste caused by the unregulated production resulted in \$25 million in non-recoverable reserves being left behind.⁸⁷ Approximately 1300 acres of the estimated 3500 acre field had been developed by 98 wells at the end of the year of unregulated production.⁸⁸ The dissipation of the reservoir pressure by the closely spaced wells and open flow production made it uneconomical to develop the remainder of the acreage.⁸⁹

2. The Schuler Field

The contrast between the physical waste in the Arkansas section of the tri-state field resulting from unregulated production and the exemplary performance from the regulated production in Louisiana and Texas made a compelling case for regulated production. The lesson was not lost on the interested parties in the Schuler Field that was discovered in July of 1937. Royalty owners, operators and landowners from the Schuler Field area petitioned the Board of Conservation for a hearing on the problems of uncontrolled production.⁹⁰ Because the Board was without jurisdiction to enforce well-spacing and its authority to order prorationing questionable due to the Miller County injunction, and it was without funds or petroleum engineers, the Schuler Field group agreed to provide funds to hire the necessary personnel so that regulations for the field could be promulgated and implemented by the Board.⁹¹ The group voluntarily agreed to abide by the Board's rules and regulations. The arrangement was to last until the Board of Conservation asked to resume state regulation. The Board agreed to the arrangement and the funds were advanced, engineers hired, and the Board held a hearing and issued well-spacing and prorationing regulations for the Schuler Field.⁹² The arrangement proved to be successful and the Schuler field avoided much of the tragedy that plagued the Arkansas Rodessa Field.

The voluntary scheme of controlled production, with the Board of Conservation as the administrator for the Schuler Field, was a stopgap measure designed to avoid irreparable physical waste and violation of correlative rights in the Schuler Field to give the state time to enact an adequate and comprehensive

Conservation Act. During the interval a committee of legislators, oil and gas operators and members of the Board of Conservation drafted a proposed Act to submit to the legislature as a replacement to Act 234.⁹³ O.C. Bailey, the Chairman of the Board of Conservation, and the first Chairman of the AOGC, reported the drafting committee adopted the 'best features' of the conservation laws of other states.⁹⁴ Chairman Bailey attended the initial meetings of the IOGC and was likely knowledgeable of the "model acts" the IOGC had been drafting since the early 1930's. Bailey opined that the drafting committee's Act, destined to be enacted as Act 105 of 1939, was the "most modern and comprehensive statute adopted by any up to that time."⁹⁵

Bailey's view was not universally accepted. It has been recorded that the interim between the implementation of the voluntary conservation scheme in the Schuler field and the passage of Act 105, was a period of "vilification, misunderstanding, scurrilous newspaper editorials, and vitriolic public expression of opinion" particularly on prorationing.⁹⁶ The adoption of well-spacing, forced integration, and proration of production that ended unregulated production of oil and gas under the rule of capture did not happen without a struggle.

V. The Arkansas Oil and Gas Conservation Act of 1939 (Act 105 of 1939)

The 1923 Conservation Act was doomed as an effective oil and gas conservation Act. The lack of comprehensive coverage, particularly the absence of an oil pro-rationing, a common purchaser or ratable take, and well-spacing to limit the density of drilling, left the industry as it had come into being, unregulated and vulnerable to waste and instability. The Arkansas Oil and Gas Conservation Act, Act 105 of 1939, was enacted in 1939 to correct the deficiencies of the prior Act and to provide a comprehensive regulatory scheme to prevent waste and protect correlative rights.⁹⁷ The Act is representative of the numerous state oil and gas conservation statutes enacted in the 1930s to remedy the evils associated with common pool exploitation by modifying the rule of capture and regulating the drilling of production of oil and gas.

The Act expressly provides that all common sources of supply for oil and gas discovered after January 1, 1937 shall be controlled and regulated by Act 105.⁹⁸ Although the Act was enacted on February 20, 1939, the legislature specifically made the statute retroactive to January 1, 1937. The obvious reason for the legislature's making the Act effective as to common sources of

supply discovered after 1937 is that the Board of Conservation had regulated or attempted to regulate the Rodessa and Schuler fields that had been discovered before that date. Surely, a majority of the interests in the Schuler field, some of whom had participated in the drafting of the Act, wanted the protection of Act 105. In early days of the Act, the number of wells in the uncontrolled fields exceeded the number of wells in the controlled fields.⁹⁹ Uncontrolled production still exists in Arkansas.

a. The Arkansas Oil and Gas Commission

The Act established the AOGC to administer the production and conservation sections of the Act.¹⁰⁰ The AOGC is authorized to promulgate rules and regulations to ensure the proper administration and enforcement of the Act.¹⁰¹ The Act, as well as the AOGC's rules and regulations, is enforced by a fine of no more than \$2,500 for violation as well as each day of violation.¹⁰² Production in violation of the Act known as illegal oil, gas or product is sanctioned¹⁰³ and subsequent dealing, such as selling, purchasing, or refining of illegal oil, gas or product is prohibited.¹⁰⁴ The administration and enforcement of the Act, including all AOGC's activities, is funded exclusively by a tax on oil and gas production.¹⁰⁵

b. Prevention of Waste and Protection of Correlative Rights

The purpose of the Act is to prevent waste and protect correlative rights.¹⁰⁶ The common occurrences of physical waste of oil and gas associated with the rule of capture are proscribed by the Act. The following are expressly prohibited: (1) "inefficient, excessive, or improper use" of reservoir energy, and the locating, spacing, drilling, equipping, operating or producing of any oil or gas well or wells in a manner which results in less than ultimate recovery;¹⁰⁷ (2) "inefficient storing of oil and the locating, spacing, drilling, equipping, operating, or producing of any oil or gas well" that reduces surface loss or destruction of oil or gas usage;¹⁰⁸ (3) abuse of correlative rights due to nonuniform, disproportionate, and unratable withdrawals causing undue drainage between tracts;¹⁰⁹ (4) "producing oil or gas in such [a] manner [causing] unnecessary water channeling or coning;"¹¹⁰ (5) operating wells with inefficient oil-gas ratios;¹¹¹ (6) "drowning with water...any stratum capable of producing oil or gas"¹¹² (7) permitting "the escape into the open air of gas in excess of the amount that is necessary for the efficient drilling or operation of a well producing both oil and gas;"¹¹³ and permitting gas to escape from a well producing gas.¹¹⁴ Any act or

practice that results in underground waste is proscribed even if not specifically defined by the Act.¹¹⁵

c. Proration and Ratable Take

Prorationing for oil, as well as gas, or both, was authorized in Act.¹¹⁶ Unlike the predecessor act of 1933 that limited the amount of gas production from gas wells when the supply of gas exceeded market demand, MER prorationing was authorized by the Act. The language of the Act simply authorizes the Commission to prorate production of oil or gas, or both, from any field or pool to prevent waste.¹¹⁷ Omitted from the statute is the language usably contained in market demand proration acts that expands the definition of waste to include production "in excess of transportation or market facilities or reasonable market demand."¹¹⁸ The legislature bailed out on market demand prorationing. Assumably, the critics of market demand prorationing from the Rodessa and Schuler field battles killed a market demand proration scheme in Act 105.

However, well allowables were likely not exclusively assigned solely on the principles of efficient rate of production of MER. The production from the uncontrolled fields was the obstacle. The Act required the AOGC to determine the aggregate amount of the statewide production from the controlled reservoirs and fields by MER prorationing.¹¹⁹ The Act did not specify how the aggregate amount of production from the uncontrolled fields was to be determined but it was to be calculated. Once the statewide total of oil or gas production was established, that amount was to be allocated between the controlled and uncontrolled reservoirs on a "reasonable basis."¹²⁰ "Small wells" in the uncontrolled reservoirs were to be given a "sufficient allowable", i.e., a "living allowable," that would not accelerate or encourage their premature abandonment.¹²¹

The question is fairly presented as to whether the AOGC used market demand prorationing to determine the aggregate statewide production from both the controlled and uncontrolled fields. As to the controlled production, they would only limit a well's allowable if the market demand allocation was below its MER allocation. Although Arkansas is not usually listed as one of the market demand proration states,¹²² there is some hint that the AOGC might have engaged in the practice. The suspicions surrounds Order No. 38-39¹²³ issued by the AOGC on August 16, 1939, that suspended the pending schedule of production allowables and "shut down" all producing wells in the controlled fields. The

Emergency Order was ostensibly to determine if physical waste was occurring in the fields and if some wells were incapable of making their wells allowable. The Order did recite that the AOGC had been previously petitioned to refrain from reducing allowables to retard the decline in reservoir pressure because the industry was in a period of "high oil consumption."¹²⁴ Moreover, at a subsequent hearing to be held on the emergency Order the AOGC was to hear evidence on the "bona fide ratable outlet" for oil and gas in the various controlled fields for the forthcoming months. The validity of the emergency Order was ultimately upheld by the Arkansas Supreme Court in *Lion Oil Refining Co. v. Bailey*¹²⁵ that held that authority of the Commission to issue emergency orders without first having a hearing did not violate the due process clauses of the State or Federal Constitutions. Although the case never mentioned market demand prorationing or the AOGC's general authority to prevent waste, it has been cited for the proposition that a conservation agency has the implied right to engage in market demand prorationing pursuant to its general statutory authority to prevent waste.¹²⁶

The traditional common purchaser or ratable take statutes that complement prorationing statutes in many conservation acts to ensure that non-uniform rates of production by wells in the common source of supply to prevent waste and protect correlative rights is absent from Act 105. Instead, Act 105 defines waste to include the "abuse of correlative rights of each owner of oil and gas in a common reservoir due to nonuniform, disproportionate, and unratable withdrawals causing undue drainage between tracts of land."¹²⁷ Consequently, the AOGC can make rules and regulations to prevent the waste or violation of correlative rights by non-uniform withdrawals but it is not authorized to compel purchasers to take and purchase ratably from all wells in the common source of supply. The AOGC's authority to compel the purchaser to take ratably is doubtful.¹²⁸

d. Well Spacing and Limiting the Density of Drilling: The Drilling Unit and its Subsequent Evolution

The most significant and far-reaching addition to the conservation of oil and gas made by the new Act is its well-spacing scheme. To avoid excess density of drilling, with its unnecessary and uneconomical wells¹²⁹ the Act established "drilling units" that permitted one well in the common source of supply for each drilling unit.¹³⁰ Drilling units were to be established by determining the maximum area that one well would "efficiently and economically" drain based on

the geologic and engineering characteristics of the reservoir. The standard of "efficient and economic" drainage applied in well spacing has often been misunderstood. The element of "economic drainage" in the standard is to permit adoption of wider spacing regulations, creating larger units, for deeper, more costly wells to ensure development of the reservoir. A field requiring deep expensive wells may not be economically feasible to develop on a tight spacing pattern that employs smaller drilling units that permits more wells to be drilled in the field. The accumulated cost of drilling numerous expensive wells on smaller drilling units may ward off the investment required to develop the field.

Although Act 105 employed the maximum area of efficient and economic drainage to determine the drilling unit size for optimum reservoir development, it prohibited the AOGC from creating a drilling unit for oil larger than 40 acres.¹¹¹ Thus, the legislature was willing to modify the rule of capture to alleviate the evils of excess density of drilling so long as the well-spacing pattern for oil was no greater than 40 acres regardless of whether the efficient and economic drainage test dictated a wider well-spacing pattern. The 40 acre unit size limitation as a ceiling on well density lasted until it was repealed in 1951.¹³²

The early drilling units established by the AOGC adopted the Texas method of well spacing by enforcing the prescribed density pattern by limiting the distance that the operator could drill a well from existing wells or property boundary lines.¹¹¹ Fortunately, the AOGC very early adopted the practice of fashioning drilling units as squares and rectangles that correspond to the rectangular system of legal descriptions of land that applies exclusively in Arkansas. Thus, a 640-acre spacing involves drilling units composed of governmental sections, 160-acre spacing involves drilling units composed of quarter sections, 80-acre spacing involves drilling units based on half-quarter sections, 40-acre spacing involves drilling units composed of quarter-quarter sections, and 10-acre spacing involves quarter-quarter-quarter sections.¹³⁴ The Act required the well to be located at the center of the drilling unit unless geologic disadvantage or topographical conditions, including surface improvements, prevented drilling at that location.¹¹⁵ Later, the AOGC permitted drilling anywhere within the unit not prohibited by an external setback location restriction.¹³⁶ In the event that surface topographical features prohibited drilling at a prescribed location, an exception location that permitted an off-pattern well could be authorized with a penalty in the form of a lower well allowable to avoid any drainage attributed to the off-pattern well.¹³⁷

The well-spacing scheme of the 1939 Act also protects the correlative rights of the mineral owners who produce from the drilling units that overlay the reservoir. The Act specifically incorporates the "just and equitable share" principle.¹³⁸ Subject to reasonable measures to prevent waste, the producer's just and equitable share of the reservoir is the amount of production "which is substantially in the proportion that the quantity of recoverable oil and gas in the developed area of the producers tract in the pool bears to the recoverable oil and gas in the total developed area of the pool, in so far as that amount can be practically ascertained."¹³⁹ The correlative rights of the producer in the drilling unit is further protected in that the AOGC cannot require the producer to drill unnecessary wells to recover his just and equitable share.¹⁴⁰ More importantly, the AOGC must protect the drilling unit from net uncompensated drainage unless offset protection wells, in addition to the drilling unit well, have been drilled on the unit to protect against drainage.¹⁴¹

For many years, the drilling units established by the AOGC were "production units." Before the AOGC had jurisdiction to establish drilling units - a common source of supply - a reservoir had to be discovered. The AOGC required a paly drilling a discovery well in the reservoir to appear before the agency and seek field rules, which established drilling units, within six months of completion of the discovery well or before three producing wells were drilled in the reservoir, whichever occurred first.¹⁴² The "field rules" establish a drilling unit or units for the applicants' completed well or wells and also for direct and offsets to the newly established productive drilling units. The practice is a modified well-by-well approach to establishing drilling units.

Exploratory drilling units were authorized by legislative amendment to the Act in 1985.¹⁴³ An exploratory drilling unit must be comprised of a governmental section or its equivalent and must be prospective of oil or gas, or both.¹⁴⁴ When 50% of working interest owners or unleased mineral owners from the proposed unit area agree to pool, the AOGC has authority to integrate the remaining non-consenting working interest owners or unleased mineral owners.¹⁴⁵ The established exploratory drilling unit, along with the right of forced integration, is limited to a period of one year from the date of the order, or alternatively, one year from the cessation of unit drilling or production from operations.¹⁴⁶ The primary benefit of the addition of the exploratory drilling unit is that it provided the remedy of forced integration to assist in the leasing of exploratory projects.

From 1939 to the advent of the Fayetteville Shale Play in 2004, the oil and gas production regulated by the Act and the AOGC was from conventional reservoirs. The administration of the Act by the AOGC during this lengthy period reflects Justice Holmes's admonition that "the life of the law has not been logic: it has been experience."¹⁴⁷ Moreover, the AOGC's practices in establishing drilling units is a classic example of the diversity that exists in state regulation of oil and gas production under conservation acts.¹⁴⁸ The Arkansas well-spacing scheme is *sui generis*, unique in the oil and gas regulatory world. The rationale underlying the Arkansas experience in administering the Act's well-spacing scheme, harking back to the political struggle to adopt the Act and subvert the common law rule of capture, was expressed by the aphorism "one cup, one straw."¹⁴⁹ This has sometimes been expressed as the unwritten "Rule of One."¹⁵⁰ Fundamental fairness, as well as equal opportunity, dictated that each drilling unit is only entitled to one well in the reservoir. Accompanying the one cup, one straw proposition was the view that if a producer shouldered the risk and paid for its share of the cost of a producing well, the AOGC was not going to meddle with the configuration of the drilling unit by deleting a tract from the unit or otherwise diluting the ownership interest. This proposition was known in Arkansas as the principle of "vested rights."¹⁵¹ Strict adherence to the Rule of One also obviated the need to deal with vested rights issues resulting from either downsizing or reforming established and developed drilling units.

The AOGC also adhered to the rectangles and squares on the surface of the earth that corresponded with the rectangular survey system of legal descriptions to draw the drilling units.¹⁵² The AOGC eschewed drawing geologic units whose surface unit boundaries corresponded with the boundaries of the subsurface reservoir.¹⁵³ The eight-inch well bores of the vertical producing wells in the reservoir provided insufficient direct evidence of the porosity, permeability, and size of the productive sand to delineate with confidence the subsurface boundaries of the reservoir. Moreover, when the field rules for the reservoir were established, there were too few producing wells in the reservoir to provide the well control necessary for the formation of geologic units. Not only would the AOGC not fashion geologic units, it would also not gerrymander the configuration of the drilling units on the surface in an attempt more closely to approximate the geographic confines of the sub-surface reservoir. The AOGC would not cross section lines or quarter section lines in the configuration of the drilling units. The objective was uniform-sized drilling units, foliuitously arranged on the basis of the rectangular survey system of legal descriptions, in an

orderly pattern that spanned the developed field and avoided the presence of "windows."¹⁵⁴

In the early days of the Act, the non-associated gas fields of the Arkoma Basin in north Arkansas were developed on 640 acre drilling units.¹⁵⁵ The 640-acre drilling units were based on the AOGC's determination that 640 acres was the area that one well would economically and efficiently drain. Over the course of time, 640-acre drilling units, based on governmental sections, became the norm for gas drilling units in north Arkansas. As older fields matured and greater knowledge of the geology of the gas fields accumulated,¹⁵⁶ doubts existed as to whether one-unit well was efficiently and economically draining the units.¹⁵⁷ Nevertheless, the Rule of One reigned supreme in Arkansas and increased density of drilling; permitting "infill" drilling in the large units was not an option. Evidence that the existing unit well was not economically and efficiently draining the drilling unit would not elicit an additional unit well from the AOGC. An additional well in a drilling unit would be authorized only if the applicant could prove that the second well would produce a reservoir separate and distinct from the reservoir of the unit well.¹⁵⁸ Unlike Oklahoma, there is no case law or statute in Arkansas that permitted modification of an AOGC order establishing drilling units due to the subsequent acquisition of geological data that signaled a change of condition in the reservoir.¹⁵⁹

The inability to drill infill wells to recover gas not being drained by the unit and problems in establishing separation of reservoirs, when reservoirs were sometimes vertically stacked and underlay a 640-acre drilling unit, made a mockery of the Rule of One's well-spacing regulations.¹⁶⁰ Consequently, in 2003, the legislature amended the well-spacing regulations.¹⁶¹ The amendment created a statutory presumption in favor of a 640-acre unit composed of a governmental section, though it permitted the AOGC to establish a larger or smaller unit. The AOGC is specifically authorized to permit additional wells in the unit and regulate the spacing between the multiple-unit wells.¹⁶² Deleted from the Act is the requirement, universally recognized by oil and gas conservation lawyers and academicians, that drilling units be established on the basis of the maximum area that one well would efficiently and economically drain. Statutory guidance to the AOGC on the parameters to be used in drawing drilling units no longer appears in the Act. One may infer that the legislature, adopting the norm of the 640-acre square mile unit as the presumptive standard, intended by implication for the AOGC to apply a standard of "reasonableness" in fashioning drilling units under the amended Act.

Regardless of the theory that underlies the presumption of a 640-acre, or square mile, statutory unit, the practice before the AOGC on well spacing in the north Arkansas gas fields had radically changed. As opposed to hearing evidence on the acreage that a single well would economically and efficiently drain, the AOGC hears evidence on the "most effective and efficient manner of locating multiple wells for the effective, but cost efficient, removal of the maximum amount of oil and gas from a square mile unit."¹⁶³ The emphasis is on economic efficiency based on the geologic characteristics of the reservoir. One may argue that economic efficiency is not foreign to the traditional formula of maximum area of economic and efficient drainage, and, thus, the change in the standard in Arkansas is not necessarily profound. Whatever one think of the dearth of the statutory standards for delineating drilling units, it is difficult to argue that the amendment is not an improvement over the Rule of One.

The AOGC draws perspective drilling units for the Fayetteville Shale and other unconventional gas reservoirs in Arkansas. Each governmental section in each county in which the Fayetteville is known or thought to exist is covered on a county-by-county basis.¹⁶⁴ The drilling units in the counties are labeled as either "exploratory drilling units" or "established drilling units," the latter being production units. Once a producing well has been completed on an exploratory unit, that unit, and the offset units contiguous to it, become production units.¹⁶⁵

Sixteen vertical or horizontal wells, or a combination thereof, may be drilled in an exploratory drilling unit.¹⁶⁶ For vertical wells, that amounts to a forty-acre spacing pattern. For horizontal wells, even though sixteen is permitted, the external and internal unit well-location restrictions have the potential to allow six to eight horizontal wells in the unit. The internal well-location restriction requires multiple wells in the unit to be spaced 448 feet apart with an allowed 20% variance.¹⁶⁷ This restriction may be waived by obtaining written consent from all unit working interest owners.¹⁶⁸ The external well-location restriction, designed to protect other drilling units from drainage, requires all wells to be set back a distance of 560 feet from any unit boundary line or any other drilling unit's well.¹⁶⁹ Exception location wells may be granted by the AOGC for topographical or geologic advantage reasons.¹⁷⁰ The 560-foot setback creates a buffer zone of 1,120 feet that extends around any drilling unit.

Horizontal wells are drilled vertically and then turn on a tight radius before proceeding horizontally through the gas-bearing strata. The well bore for a horizontal well is defined by the AOGC rules as the entire perforated length of the lateral section of the horizontal well.¹⁷¹ Consequently, based on that definition, a horizontal well involves a long narrow cylinder of a producing reservoir. The cylinders may be arranged in such a fashion to achieve effective and cost-efficient drainage of the reservoir.¹⁷²

The AOGC permits horizontal wells to extend into more than one drilling unit when the majority in interest of working interest owners seeks authorization from the Commission and voluntarily agrees to the allocation of costs and the proceeds from production.¹⁷³ Administrative approval of the "cross unit" well by the Director of the AOGC, which avoids a hearing and a decision by the Commission, is authorized if the affected drilling units have been previously integrated.¹⁷⁴ The costs and proceeds of production for the "cross unit" well are allocated by drawing a "cylindrical unit" around the perforated well bore. The costs and proceeds shared between each participating drilling unit are based on the proportion of the cylindrical unit (the calculated area) that is located in each such drilling unit.¹⁷⁵ The cylindrical unit is drawn by dividing a circle with a radius of 560 feet at both the beginning point and the ending point of the perforated lateral well bore and inserting a rectangle 560 feet in width on both sides of the perforated horizontal lateral.¹⁷⁶ It should be noted that the cylindrical unit is not a formal "drilling unit" under the Arkansas well-spacing regime, but is merely a basis for allocating costs and proceeds of production from cross unit wells.

Permitting horizontal wells to extend into, or encroach upon, adjoining drilling units facilitates the production of gas situated in the 1120-foot buffer zone that are designed to protect against drainage and are situated between the productive areas of the drilling units. Otherwise, the gas would be stranded and optimum development of the reservoir would be precluded.

e. Forced Integration

Compulsion by the state to achieve pooling when the parties failed to voluntarily pool was a controversial matter in 1939. The state's meddling with property rights to the extent that it could compel a mineral owner to participate in a drilling venture, committing its share of the minerals in the reservoir to the project and imposing recovery of the prorata share of costs, in the absence of

consent, was viewed with much skepticism. The state of Texas, always the largest oil and gas producer in the lower 48, didn't enact a compulsory pooling statute until 1965.¹⁷⁷ Kansas doesn't yet have such a statute. Nevertheless, the inability of working interest owners to force integrate provided non-consenting parties undue leverage to exact unfair terms in the negotiation of the voluntary pooling agreement. Moreover, in the absence of forced integration, the refusal to voluntarily pool by intransigent non-consenting working interest owner or unleased mineral owners could bar development of society's valuable natural resources.

Arkansas was progressive in adopting forced integration in the 1939 Act. Reciting the policy of preventing waste and avoiding the drilling of unnecessary wells, the Act provided that when working interest owners or unleased mineral owners in two or more separately owned tracts located within a drilling unit fail to voluntarily pool, the AOGC shall integrate their interest so that the drilling unit can be developed.¹⁷⁸ The terms of the mandated integration must be just and reasonable, provide each integrated party the opportunity to recover their fair share of the reservoir without unnecessary expense and avoid net uncompensated drainage.¹⁷⁹

Despite the spirit of enlightenment that included forced integration in the 1939 Act, the system implemented by the statute was flawed. The party who integrated the non-consenting interest to drill the unit well recovered the integrated party's share of the development costs (drilling, completing and operating costs) from the integrated party's share of the unit production.¹⁸⁰ With the exception of permitting the developing mineral owner to recover a reasonable charge for supervision from the integrated party, the scheme is identical to the accounting applied to the developing and non-consenting co-tenants under the Statute of Anne.¹⁸¹ The integrating party fronts the integrated party's share of the development costs and only recovers those costs from the latter's share of production. In the event the well is a dry hole or a marginal well that never pays out, the integrating party bears the risk of loss on the carried interest's share of the well costs. The integrated party is a "carried interest" who gets a free ride down the well bore. The integrating party is not compensated for assuming the risk of loss.

It was unsound to apply the Statute of Anne standard of accounting applicable to developing and non-consenting co-tenants to forced integration under the Conservation Act. Placing the risk of loss for development on the

integrating party provided no incentive for the non-consenting working interest owner or unleased mineral owner to voluntarily pool pursuant to a plan of development that required paying their proportionate share of the costs of development and participating in the risk. Refusing to pool and going forward with integration, avoiding the loss of investment on the dry hole or unprofitable well, and being carried on a profitable producing well by 100% of the share of the costs to be recovered from production, wasn't a bad deal.

The legislature made sweeping changes to forced integration in 1963.¹⁸² Overall, the free ride down the well for the carried interest was burdened with a risk factor penalty to compensate the participating interests for bearing the risk of loss. A choice with options was provided for the integrated parties. The unleased mineral owners who elected the carried interest status were accorded a statutory 1/8 royalty during the pay out period.

Forced Integration in Arkansas today, reflecting the 1963 Amendment, can be simply described. If the parties do not agree to pool voluntarily, the AOGC, upon the application of any mineral owner or oil and gas lessee, is required to force integrate all tracts and interests for unit development.¹⁸³ The integration order authorizes the drilling, completion, equipping and operation of the well on the unit¹⁸⁴ and designates the operator of the well.¹⁸⁵

The unleased mineral owner has choices under the integration order.¹⁸⁶ She may elect to be "leased" in which she receives a competitive royalty, but not less than a 1/8th share, plus a bonus based on a "reasonable consideration" to be determined by the AOGC.¹⁸⁷ Alternatively, she may elect to participate in the well, paying her proportionate share of the well costs and taking her proportionate share of revenues attributable to her proportionate share of the production.¹⁸⁸ Having paid her well costs up front, she takes her share of the risk by participating in the well. Another option is to go "non-consent" and be "carried" by the participating owners who pay her share of the costs that are subsequently, if ever, recovered from her proportionate share of the revenues attributable to her proportionate share of the production.¹⁸⁹ Because the participating owners are taking the risks of her share of the costs, the AOGC will assess a "risk factor" penalty against the carried interest based on the geologic risk.¹⁹⁰ The risk factor penalty is usually 400%, being her proportionate share of the well costs times four (4) unless the prospect involves extraordinary risk, which will enhance the risk factor penalty.¹⁹¹ Once payout occurs, the costs and risk-factor penalty are recovered from her share of the

revenues, the non-consenting party recovers her proportionate share of the production.¹⁹² Additionally, the Act generously accords the non-consenting unleased mineral owner a 1/8 royalty share pending payout.¹⁹³ Finally, if the unleased mineral owner fails to make an election, she will be deemed to be leased.¹⁹⁴

The working interest owner - the lessee who holds an oil and gas lease from a mineral owner in the unit - may participate in the drilling of the well by paying its share of the costs or by electing to go nonconsent.¹⁹⁵ If the working interest owner fails to specify its election, it is deemed to have elected to go non-consent.¹⁹⁶

Once the AOGC promulgates an integration order for a drilling unit, all operations on any part of the unit, including drilling or operation of a well, are deemed to be as if the operations were conducted on each separately owned tract and interest in the drilling unit.¹⁹⁷ Likewise, production from any part of the drilling unit shall be deemed to be production from every tract or interest located in the unit.¹⁹⁸ In effect, the Act dictates that the integration order has the same effect on oil and gas lease terms, including the secondary term requirement of production in the habendum clause, as to the voluntary pooling of the lease interests.¹⁹⁹

f. Compulsory Unitization

Act 105 of 1939 did not provide for compulsory unitization. The consequence of the omission of compulsory unitization from the Conservation Act was highlighted by subsequent events that occurred in the McKamike Patton Field. The field, discovered in 1940 and covered 5000 acres, experienced a precipitous drop of reservoir pressure in the late 1940's. Some operators in the field promoted a voluntarily unitization plan for gas re-injection to enhance the reservoir pressure to avoid substantial loss of oil and gas reserves. Even though the plan of voluntary unitization was executed by 97% of the working interest and 96% of the royalty owners, it failed due to the hold out of the minority interests. The AOGC, upon petition by the proponents of the voluntary plan, issued an Order requiring unitization. The Arkansas Supreme Court in *Dodson v. Ark. Oil and Gas Comm'n*,²⁰⁰ invalidated the AOGC's Order, holding that the agency had no jurisdiction to compel field wide unitization.

Shortly thereafter, Act 134 of 195,²⁰¹ added a compulsory unitization provision to the Conservation Act. The Act requires, *inter alia*, that the AOGC must determine the following criteria is satisfied before issuing an Order requiring compulsory unitization: 75% of the working interest and royalty and overriding royalty interests from the total proposed unit area have executed the agreement;²⁰² the unit operation is reasonably necessary to prevent waste, increase ultimate recovery of oil and gas, and protect the correlative rights;²⁰³ and that the value of the additional oil to be recovered from the proposed unit operation will exceed the additional cost incident to conducting the operation.²⁰⁴

The Act further requires that the AOGC's Order be "fair and reasonable"²⁰⁵ and, *inter alia*, the participation formula must provide that each separately owned tract will receive its fair share of the production of the unit area.²⁰⁶ The Act specifically prohibits the AOGC from adopting or implementing an allocation formula that is not based on the relative contribution, exclusive of the production equipment, made by each separately owned tract.²⁰⁷

A postscript on the Schuler Field makes a salient point on fieldwide unitization. The statement on the Shuler Field is from Kramer and Martin's excellent treatise on The Law of Pooling and Unitization:²⁰⁸

A classic example of the success of pressure maintenance by the injection of gas and water was the Shuler Field in Union County, Arkansas. This field was discovered in 1937 and unitized four years later. Had the field been unitized at the time of its discovery or soon thereafter, the drilling of seventy-one wells could have been avoided. During the four years of primary operation, billions of cubic feet of rich gas were vented into the air. Prior to unitization, the field produced a total of approximately 16 million barrels of oil with a drop of reservoir pressure from 3,548 pounds to 1,625 pounds or a difference of 1,923 pounds. Thus, during the those four years, 55 percent of the vital reservoir pressure was expended in the production of 11 percent of the total oil in place.

During the first eight years of operation under the unitization plan, 30 million barrels of additional oil was produced with a pressure drop of

only 185 pounds. Under primary production operation the field would have long since been exhausted, whereas, by late as 1954 it was still producing well over 5,500 barrels of oil per day. Through January 1, 1953, the field had produced over 71 million barrels of oil. The estimated recovery as a result of unitized operations is approximately 100 million barrels of oil, a recovery to close to 90 percent of the oil in place.

The unitization of a field that shows promise for a pressure maintenance project should be implemented as early as possible after discovery to maximize ultimate recovery from the reservoir. The sooner the better is the lesson to be learned from the Shuler Field.

Conclusion

Arkansas' modern Oil and Gas Conservation Act, comprising Act 105 and its major amendments, has been successful in regulating oil and gas production to eliminate economic and physical waste. Reservoirs discovered subsequent to Act 105 have been controlled and well spacing and MER prorationing have eliminated the excessive density of drilling and rates of production that occasioned so much economic and physical waste during the era of uncontrolled production. A fair and balanced statutory remedy of forced integration has blunted the ability of non-consenting interests to impede the drilling of exploratory and development wells. Well spacing and forced integration have provided the framework for the oil and gas drilling transaction in Arkansas. The established exploratory unit or drilling unit has provided certainty as to the location and geographic extent of the area of the prospect. Force integration has established the relative rights of the working interests and mineral and royalty interest within the unit. Unitized reservoirs and fields are not uncommon in South Arkansas, either as an early in the life of the field pressure maintenance projects or as belated secondary recovery operations. The productive life of the field or reservoir is extended and recovery is enhanced. Compulsory unitization either created the unitized project or its threat facilitated its creation by voluntary unitization.

The Conservation Act proved sufficiently flexible to accommodate state regulation of production from unconventional reservoirs in Arkansas. The Act's ample rule making authority vested in the AOGC, which was exercised wisely by the agency, permitted the imposition of rules to govern the regulation of the development of the Fayetteville Shale deposition. The AOGC's state

wide rules for Fayetteville Shale development accommodated horizontal drilling and hydraulic fracturing (fracing) that proved necessary to economically complete Fayetteville Shale wells. Approximately 5000 plus wells, mostly horizontal,, have been completed and are producing in the B-43 area. As a consequence, Arkansas is the 8th largest producer of natural gas in the United States.²⁰⁹

So there is much success to attribute to Act 105 and post-1939 oil and gas conservation. However, the pre-1939 losses occasioned by waste still casts a deep shadow over the industry in Arkansas. The Smackover Field, discovered in 1922, was Arkansas' "giant" oil and gas field, spanning in excess of 25,000 acres.²¹⁰ At its peak year of production, in 1925, it was the leading oil producing field in the world.²¹¹ The sheer amount of oil wasted, most being attributed to underground waste resulting from depletion of gas pressure, was enormous. O.C. Bailey, in 1938, opined that one billion barrels of recoverable reserves were left behind in the Smackover Field, as a consequence of waste.²¹² Basically, the Smackover Field was ruined.

It is difficult to fault the pioneer operators in the early 1920's that were committing the waste. They were ignorant as to associated oil and gas reservoir mechanics and the efficient rates of production and pressure maintenance principles that were pioneered by the early petroleum engineers. The truth of the matter is that Arkansas' misfortune with Smackover and the smaller oil fields discovered in the 1920's was based on fortuitous circumstances. The field was discovered prior to the development of efficient reservoir management to avoid underground waste by the science of petroleum engineering. The Smackover Field turned out to be the industry's lesson on how not to do it for the big discoveries of the late 1920's and early 1930's.

Consequently, in Arkansas, the ubiquitous language in the modern parlance of oil and gas conservation, "prevent waste and protect correlative rights", the cornerstone of Act 105, is not simply a recitation of theory, it is our experience. The loss in the early 1920's of 1 billion barrels of oil production to the future economy of the State of Arkansas has not been a small price to pay. The tragic legacy of the Smackover Field is "indelibly woven into the fabric of conservation and controlled production history."²¹³

¹ For a definitive discussion of the evolution of the Rule of Capture in oil and gas law, See, Bruce M. Kramer and Owen L. Anderson, The Rule of Capture - An Oil and Gas Perspective, 35 *Envtl.* 899 (2005).

² Robert E. Hardwicke, The Rule of Capture and Its Implications as Applied to Oil and Gas, 13 *Tex. L. Rev.* 391, 393 (1935). Kramer and Anderson, N. 1 at 900 refer to Hardwicke's definition as a "straight forward formulation of the rule."

³ *Barnard v. Monongahela Gas Co.*, 216 Pa. 362, 365, 65 A. 801, 802 (1907).

⁴ 1 Eugene Kuntz, A Treatise on the Law of Oil and Gas § 4.2 at 87 (1987).

⁵ Maurice H. Mell'ill, The Public's Concern with the Fuel Minerals 32 (1960).

⁶ "Given the then well-established recognition of the landowner's right to produce the minerals beneath his land, and the existing want of information concerning the properties, the source, and the probable longevity of oil and gas, I hardly see how the judges could have evolved any other set of principles than they did." *Id.*

⁷ 1 Eugene Kunta, *supra* N. 4 at § 4.1 at 90.

⁸ See Richard J. Pierce, Jr., State Regulation of Natural Gas in a Federally Deregulated Market: The Tragedy of the Commons Revisited, 73 *Cornell L. Rev.* 15 (1987).

⁹ The Model Conservation Act, 1.0.C.C. (1964) defines Waste as follows:

"Waste" means:

(A) the inefficient, excessive, or improper use of reservoir energy or unnecessary dissipation of reservoir energy;

(B) the inefficient storing of oil or gas;

(C) the locating, drilling, equipping, operating, or producing of an oil or gas well in a manner that causes or tends to cause a reduction in the quantity of oil or gas ultimately recoverable from a reservoir under prudent and proper operations, the drilling of unnecessary well, or the loss or destruction of oil or gas either at the surface or below the surface;

(D) the production of oil or gas in excess of pipeline, marketing, or storage capacities, in excess of reasonable market demand, in excess of the amount reasonably required for properly drilling, completing, testing, or operating a well or other facilities for recovering, processing, or transporting oil, gas, or by-products, or in excess of the amount otherwise utilized on the acreage from which the oil or gas is produced; or

(E) other dissipation, production, or use of oil or gas underground or above ground, or in storage, that is careless, needless, or without valuable result.

¹⁰ Wallace F. Lovejoy and Paul T. Homan, Economic Aspects of Oil Conservation Regulation, 121 (1967).

¹¹ For an extended discussion of reservoir mechanics relating to production, see, _____, The Origin, Occurrence and Production of Oil, 8-32, in *Oil for Today - and for Tomorrow*, Interstate Oil Compact Commission (1953)

¹² "Efficient recovery of the oil from a reservoir is not taken care of by chance; it may be fulfilled only through careful and deliberate action by the producers. Experience has shown that one of the most essential factors in meeting these requirements is control of the rate of production. Excessive rates of withdrawal lead to rapid decline of reservoir pressure, to release of dissolved gas, to irregularity of the boundary between invaded and non-invaded sections of the reservoir, to dissipation of gas and water, to trapping and by-passing of oil, and, in extreme cases, to complete loss of demarcation between the invaded and non-invaded portions of the reservoir, with dominance of the entire recovery by inefficient dissolved-gas drive. Each of these effects of excessive withdrawal rates reduces the ultimate recovery of oil. The Origin, Occurrence and Production of Oil, p. 31, in *Oil for Today - and for Tomorrow*, Interstate Oil Compact Commission (1953)

¹³ J. Scott Parker, A Changing Landscape: Environmental Conditions and Consequences of the 1920s Union Oil County Booms, ARK. HIST. Q. Vol. 60 No. 1, p. 38 (Spring 2001).

¹⁴ *Ohio Oil Co. v. Indiana*, 190 U.S. 177 (1900), a United States Supreme Court decision, is generally considered to be the fount of the correlative rights doctrine. The case involved an expansive gas field which encompassed some areas that produced oil associated with gas. Indiana had a statute that prohibited the emission of gas from wells into the open air. The defendant, Ohio Oil Co., was producing oil from the associated oil and gas area of the field and was emitting the gas into the open air. The plaintiff, the State of Indiana, sought to enjoin the defendant from emitting the gas in violation of the statute. The defendant alleged that the gas was being used to lift the produced oil to the surface and that the oil could not be produced without emitting the gas. Likewise, the produced oil had more value than the gas lost at the surface. Plaintiff alleged that the natural gas from the fields was used for fuel and light for numerous municipalities in the area and that the emitting of gas into the open air wasted the gas and decreased the supply for the municipalities. Further, the plaintiff alleged the defendant's emitting the gas was reducing the "back pressure" that was preventing salt water encroachment in the reservoir. The defendant argued that the enforcement of the statute would shut down his oil production and would constitute a taking of his property in violation of due process. Justice White, in the Supreme Court's opinion affirming the trial court's issuance of the injunction, observed:

¹⁵ "These existing property relations, called the correlative rights of the owners of the land in the common source of supply, were not created by statute, but held to exist because of the peculiar physical facts of oil and gas. The term "correlative rights" is merely a convenient method of indicating that each owner of lands in a common source of supply of oil and gas has legal privileges as against other owners of the land therein to take oil or gas therefrom by lawful actions conducted on his land; that each such owner has duties to the other owners not to exercise his privileges of taking so as to injure the common source of supply; and that each such owner has rights that other owners not exercise their privileges of taking so as to injure the common source of supply. 1 Walter L. Summers, § 63.

¹⁶ *Elliff v. Texon Drilling Co.*, 146 Tex. 575, 210 S.W.2d 558 (Tex. 1948).

¹⁷ 3 Eugene Kuntz, *supra* N. 4 at § 4.7 at 92.

¹⁸ *Wronski v. Sun Oil Co.*, 89 Mich. App. 1, 279 N.W.2d 564 (Mich. App. 1979).

¹⁹ Kramer and^d Anderson, *supra* Note 1 at 6-11.

²⁰ The Origin, Occurrence and Production of Oil, p. 31, in *Oil for Today - and for Tomorrow*, Interstate Oil Compact Commission (1953)

²¹ *Id.*

²² Wallace F. Lovejoy and Paul T. Homan, Economic Aspects of Oil Conservation Regulation, 26 (1967), citing Erich W. Zimmerman, *Conservation in the Production of Petroleum*, Yale University Press, p. 24, (New Haven, 1957).

²³ The primary purpose of a petroleum conservation statute is prevent physical waste above ground and underground in oil and gas production operation: however, the due process and equal protection clauses of the Federal Constitution, and usually similar clauses in state constitutions, as well as provision or provisions in conservation statutes, require that the regulation must protect the property rights of those who have the right to produce, subject to reasonable regulation to prevent waste. IOCC Governors' Special Study Committee, p. 6, (Oklahoma City, 1964), cited in Lovejoy and Homan, N. 20 at p.27. The implication is that "prevention of physical waste appears as the primary aim" of conservation acts. *Id.*

²⁴ Stabilization Through Conservation - or was it vice versa? The Oil and Gas Journal, p. A-52-A-56, (date unknown).

²⁵ George W. Hazlett, Property Rights and Oil Production, in *Oil for Today - and for Tomorrow*, Interstate Oil Compact Commission 39,40 (1953).

²⁶ Wallace F. Lovejoy and Paul T. Homan, *supra* N. 20 at 128.

²⁷ 52 Okl. St. Ann. 271-280, Though enacted in 1915, the Act wasn't used until the 1930's.

²⁸ *Id.*

²⁹ For a discussion of the 1915 Proration Act and its amendments, see, 1 W.L. SUMMERS, § 6.15 - 6.19.

³⁰ Title 102, Revised Civil Statutes of Texas, Article 6014. Pursuant to the Act, Texas defines waste as "The production of crude petroleum oil in excess of transportation or market facilities or reasonable market demand."

³¹ Wallace F. Lovejoy and Paul T. Homan, *supra* N. 20 at 128.

³² *Id.* at 203.

³³ Wallace F. Lovejoy and Paul T. Homan, *supra* N. 20 at 128, 129.

³⁴ 1913 Okla. Sess. Laws 198.

³⁵ Sun Oil Co. v. Railroad Commission, 69 S.W.2d 609 (Tex. Civ. App. 609, 1933).

³⁶ For a modern treatment of the Voluntary Pooling Clause contained in the oil and gas lease, see Mitchell E. Ayer, *Navigating the Pooling Clause Waters: New and Recurring Issues*, 53 ROCKY MTN. MIN. L. INST. 33-1 (2007).

³⁷ 4 Eugene Kuntz, *supra* N.4 at 48.3(2).

³⁸ 4 Eugene Kuntz, *supra* N.4 at 48.3(3).

³⁹ For a discussion of equitable or judicial pooling in Arkansas, see, 4 Bruce M. Kramer and Patrick H. Martin, *The Law of Pooling and Unitization*, § 7.02 (3'd Ed. 2001).

⁴⁰ 3 Eugene Kuntz, *A Treatise on the Law of Oil and Gas* § 42.5(f) at 415-416 (1998).

⁴¹ *Id.*

⁴² For an exhaustive list of literature on voluntary unitization, see 1 Bruce E. Kramer and Patrick H. Martin, *supra* N. 39 at 817.01 at N.1.

⁴³ Robert E. Hardwicke, *Antitrust Laws v. Unit Operation of Oil or Gas Pool*, page 1 to 33, (1948 Maple Press Co.), provides a general overview of Doherty's views and activities on regulation of production to avoid waste of oil and gas resources.

⁴⁴ *Id.* At 22.

⁴⁵ Owen L. Anderson, "Mutiny: The Revolt Against Unsuccessful Unit Operations. 30 Rocky Mt. Min. L. Inst. 3-23 (1984).

⁴⁶ *Id.*

⁴⁷ Wallace Hawkins, *The American System 10, Oil and Gas Conservation - 1948*, (presented to North Texas Chapter of A.I.M.E., January 5, 1949) (found in AOGC historical files). Hawkins cited the following comment from an opponent: "unitized operations in oil field, which in fact means monopolized operations, constitute a unified operating interest whereby everybody but the monopolizers get crucified."

⁴⁸ *Id.* at 11.

⁴⁹ 52 Okla. Stat. Ann. §§ 287.1 to 187.15.

⁵⁰ For an abbreviated version of the industry's struggle with distressed crude oil, the formation of the Interstate Oil Compact, and the enactment of comprehensive state oil and gas conservation acts, see Earl Foster, *Maximum Oil Production Through Conservation Laws 70-71*, Interstate Oil Compact Commission (1952). For a detailed treatment of the subject, see Robert E. Hardwicke, *Antitrust Laws v. Unit Operation of Oil and Gas Pools*, The Maple Press Co. (1948).

⁵¹ Hardwicke, *supra* N. 43 at 15.

⁵² *Id.* At 22.

⁵³ W. Henry Rector, *Legal Conservation of Oil and Gas Law in Arkansas; A Symposium*, in *LEGAL HISTORY OF CONSERVATION OF OIL AND GAS*, 16 (Am. Bar. Ass'n 1938).

⁵⁴ *Id.* at 19.

⁵⁵ Act 166 of March 17, 1917, 1917 Ark. Acts 890.

⁵⁶ *Id.* at § 1.

⁵⁷ *Id.* at § 8.

⁵⁸ *Id.* at § 8.

⁵⁹ *Id.* at § 18. Act 144 of 1921 was enacted to prescribe the method of testing the open flow capacity of the Well. Act 144 of February 18, 1921, 1921 Ark. Acts 216.

⁶⁰ The purpose of the reduced flow is explained in *Nowata Gas Co. v. Henry Oil Co.*, 269 F. 742, 748 (8th Cir. 1920), wherein the Eight Circuit Court of Appeals, discussing 52 Okla. St. Ann. § 29, an early Oklahoma act that prohibited the taking of more than 25% of the daily natural flow of gas wells, stated: "When natural gas is permitted to flow freely, it tends to drain the gas from the underlying sands in the neighborhood of the well too rapidly, with the result that the water below the gas sands finds its way up towards the outlet of the gas at the base of the well, cuts off the lateral inflow of the gas, and drowns the well. If the outflow of gas is under pressure, and lateral flow towards the well will be more extensive and long continued, and in the end the gas will be more completely removed from the gas sands, and the gas field more thoroughly exhausted."

⁶¹ Act 166 § 12.

⁶² *Id.* at § 4, 5 and 15.

⁶³ Act 664 of March 23, 1923, 1923 Ark. Acts 555.

⁶⁴ *Id.* at § 1.

⁶⁵ *Id.* at § 2.

⁶⁶ *Id.* at § 16.

⁶⁷ *Id.* at § 4.

⁶⁸ *Id.* at § 5, 6.

⁶⁹ The Administration of the Act was transferred from the Arkansas Railroad Commission to the four (4) member Board of Conservation in 1927. Act 221 of March 23, 1927, 1927 Ark. Acts 714.

⁷⁰ *Id.* at § 20.

⁷¹ Act 118 of February 13, 1923, 1923 Ark. Acts 67.

⁷² L. L. Jordan, Drake Well Foundation Symposium, p. 2.

⁷³ Act 234 of March 28 of 1933, 1933 Ark. Acts 720.

⁷⁴ *Id.* at 2.

⁷⁵ *Id.* at § 5,6,7.

⁷⁶ *Id.* at § 8, 9,10.

⁷⁷ *Id.* at § 4.

⁷⁸ Gerald Forbes, Brief History of the Petroleum Industry in Arkansas, The Arkansas Historical Quarterly, 28, 36 (March 1942) *supra* N. At 36.

⁷⁹ Petroleum Investigation, Hearing on H.R. 290 and H.R. 7302 Before the Subcomm. on Interstate and Foreign Commerce, 77th Cong. 971, 1007 (1940) (statement of O.C. Bailey, Chairman, Arkansas Oil and Gas Commission.

⁸⁰ *Id.*

⁸¹ *Id.*

⁸² Alce M. Crowell, Rodessa an Object Lesson in Control, The Oil and Gas Journal, p. 28, (September 29, 1938).

⁸³ *Id.* at 105.

⁸⁴ *Id.* at 105. It has been suggested that Louisiana's reservoir performance might have been better but for the fact that wells offsetting the Rodessa field in Arkansas were pennitted to produce in excess of the state's fixed allowables to prevent drainage from Arkansas' open flow wells. Gerald Forbes, *supra* N. 78 at 37.

⁸⁵ Louisiana's reservoir performance might have been better but for the fact that off set wells from the Rodessa field in Arkansas were permitted to produce in excess of the state's fixed allowables to prevent drainage from Arkansas' open flow wells. Gerald Forbes, *supra* N. 78 at 37.

⁸⁶ O.C. Bailey, Petroleum Investigation, *supra* N. 79 at 1008.

⁸⁷ Gerald Forbes, *supra* N 78 at 38.

⁸⁸ Alec M. Crowell, *Supra* N. 82 at 105.

⁸⁹ *Id.*

⁹⁰ O.C. Bailey, Petroleum Investigation, *Supra* N. 79 at 1008.

⁹¹ Gerald Forbes, *Id.* at 37.

⁹² *Id.* The Shuler Field was the first controlled field in Arkansas.

⁹³ Natural Gas Investigation, Dock, No. G-580, (Statement of O.C. Bailey, Chairman, Arkansas Oil and Gas Commission, p. 2, Federal Power Commission (Nov. 26, 1945)

⁹⁴ *Id.* at 2.

⁹⁵ *Id.*

⁹⁶ Gerald Forbes, *supra* N. 78 at 37.

⁹⁷ Act 105 of February 20, 1939, 1939 Ark. Acts 219. The conservation statutes begin at § 15-72-101 of the Arkansas Code.

⁹⁸ *Id.* at 15-71-107(a)(1) (1994).

⁹⁹ In 1943, Chairman Bailey noted that there were 1349 oil wells in controlled fields and 2422 oil wells in uncontrolled fields. The daily production from the controlled fields far exceeded the production from the uncontrolled fields by 64,923 barrels *bid* to 16,876 *bid*. Hearing Before the Subcomm. on Naval Affairs, 79th Cong. ____ (1943) (statement of O.C. Bailey, Chairman, Arkansas Oil and Gas Commission).

¹⁰⁰ *Id.* at § 15-71-101 (1994d) (Supp. 2009)

¹⁰¹ *Id.* at § 15-71-110(d)

¹⁰² Ark. Code Ann. § 15-72-103(a)(1) (Supp. 2009). Additionally, the filing of a false entry or statement of fact, or the omission of full, true, and correct entries, or mutilation or alteration of any report or transaction, in an attempt to evade any Arkansas Oil and Gas Commission (AOGC) rule, regulation, or order is a misdemeanor and punishable by a \$5,000 fine or imprisonment for six months, or both. ARK. CODE ANN. § 15-72-104(a)(1)-(4) (1994).

¹⁰³ Ark. Code Ann. § 15-72-102 (4)-(6) Supp. 2009) (defining illegal gas, illegal oil, and illegal product). The penalty for producing illegal oil or gas is a fine of not more than \$2,500 a day for each and every act of violation. Ark. Code Ann. § 15-72-103(a)(1).

¹⁰⁴ Ark. Code Ann. §§ 15-72-401 (1994) 6.

¹⁰⁵ Ark. Code Ann. § 15-71-116(a)(1) (Supp. 2009).

¹⁰⁶ Ark. Code Ann. § 15-72-101 (1994). The Declaration of Policy of the Act reads as follows:
In recognition of past, present, and imminent evils occurring in the production and use of oil and gas, as a result of waste in the production and use thereof in the absence of coequal or relative rights of owners of crude oil or natural gas. . this law is enacted for the protection of public and private interests against such evils by prohibiting waste and compelling ratable production.

¹⁰⁷ Ark. Code Ann. § 15-72-102(15)(A).

¹⁰⁸ *Id.* § 15-72-102 (15) (B).

¹⁰⁹ *Id.* § 15-72-102(15)(C).

¹¹⁰ *Id* § 15-72-102 (15)(O).

¹¹¹ *Id* § 15-72-102(15)(E).

¹¹² *Id* § 15-72-102(15)(F)

¹¹³ *Id* § 15-72-102(15)(I)

¹¹⁴ *Id* § 15-72-102(15)(K)

¹¹⁵ *Id* § 15-72-102(15)(G)

¹¹⁶ §(J) Act 105 of February 30, 1939, 1939 Ark. Acts.

¹¹⁷ *Id*.

¹¹⁸ Article 604(J), Title 102, Revised Civil Statutes of Texas.

¹¹⁹ § 16A Act of 05 of February 30, 1939, 1939 Ark. Acts. 219, codified at 15-17-324(a).

¹²⁰ *Id*.

¹²¹ *Id*.

¹²² Wallace F. Lovejoy and Paul T. Homan, *supra* N. 20 at 129. The states with market demand status in 1965 were Texas, Louisiana, Oklahoma, New Mexico, Kansas, Alabama, Florida, Iowa, Michigan, North Carolina, North Dakota and Washington. The top 5 market demand states were Texas, Louisiana, Oklahoma, New Mexico and Kansas who had 70% of the crude oil production.

¹²³ Order no. 38-39, Aug. 16, 1939, Conservation and Prevention of Waste of Crude Petroleum and Natural Gas in the State of Arkansas.

¹²⁴ *Id*.

¹²⁵ 260 Ark. 436, 139 S.W.2d 683 (1940).

¹²⁶ Eugene O. Kuntz, et al., *Oil and Gas Law Cases and Materials*, p. 89 (West Publishing Co.

¹²⁷ § 1(3) Act of 105 of February 30, 1939, 1939 Ark. Act 219, codified at 15-72-102(15)(C).

¹²⁸ 104 W.L. SUMMERS § 317.

¹²⁹ The language of Act 105 well states the necessity for well spacing: "For the prevention of waste and to avoid the augmenting and accumulation of risks arising from the drilling of an excessive number of wells, ...the Commission shall ...a drilling unit or units for each pool." Act 105 of February 20, 1939, 1939 Ark. Act. 210, § 14(8).

¹³⁰ *Id.*

¹³¹ *Id.*

¹³² - Act 28 of January 30, 1951, 1951 Ark. Acts. 29.

¹³³ Integration Order, Miller (Rodessa) Field, No. 18-39, Ark. Oil & Gas Comm., May 2, 1939; Bucker Lime Pool Field Rules, Order No. 12-39, Ark. Oil & Gas Comm., March 31, 1939.

¹³⁴ Rarely, if ever, did the AOGC cross-section lines or quarter-section lines in establishing drilling units.

¹³⁵ Act of Mar. 31, 2003, § I, 2003 Ark. Act. 964 (amending Ark. Code Ann. § 15-72-302(c)(1)).

¹³⁶ See ARK. CODE ANN. § 15-72-302(c)(1) (Supp. 2009).

¹³⁷ *Id.* § 15-72-302(c)(1)-(2)

¹³⁸ Wronski v. Sun Oil Co., 279 N.W.2d 564, 569-70 (Mich. Ct. App. 1979) (discussing the "fair share" principle).

¹³⁹ *Id.* Ark. Code Ann. § 15-72-302(d)(1).

¹⁴⁰ Ark. Code Ann. § 15-72-302(a)(1).

¹⁴¹ *Id.* § 15-72-302(a)(2).

¹⁴² Ark. Oil & Gas Comm'n. General Rules & Regulations B-38(a) (2009), available at <http://www.aogc.state.ar.us/OnlineData/Fonns/Rules%20and%20Regulations.pdf>

¹⁴³ Act of 1985, No. 881 (codified at ARK CODE ANN. § 15-72-302(e)(1)-(3)(Supp. 2009)).

¹⁴⁴ ARK. CODE ANN. § 15-72-302(e)(2).

¹⁴⁵ *Id.*

¹⁴⁶ *Id.* § 15-72-302(e)(3).

¹⁴⁷ OLIVER WENDELL HOLMES, THE COMMON LAW I, (Little, Brown, & Co. 1881).

¹⁴⁸ Owen L. Anderson, "State Conservation Regulation-Single Well Spacing and Pooling-Vis-à-vis Federal and Indian Lands," *Special Institute on Federal Onshore Oil and Gas Pooling and Unitization*, in *Federal Onshore Oil and Gas Pooling and Unitization* 2-1 (ROCKY MT. MIN. L. FOUND. 2006).

¹⁴⁹ The aphorism "one cup, one straw" was the explanation for the Arkansas well-spacing scheme under the Act provided by the former Chairman of the AOGC, Boyd Alderson, who served many years on the commission, was a player in the industry prior to 1939, and witnessed the political process that resulted in the adoption of the Act.

¹⁵⁰ Thomas A. Daily & W. Christopher Barrier, *Well, Now, Ain't It Just Fugacious!: A Basic Primer on Arkansas Oil and Gas Law*, 29 U. ARK. LITTLE ROCK L. REV. 211, 242 (2007); Dorsey Ryan, *Optimal Density*, 39th ANN. NAT. RES. L. INST. 1, 2 (ARK. BAR ASS'N 2000). Ryan, the chief proponent of increased density in the Noli Arkansas gas fields, described the rule as the "infamous rule of one."

¹⁵¹ The late Ned Price, a south Arkansas oil producer and longtime member of the AOGC, was a passionate proponent of the "vested rights" principle in administering the Arkansas well-spacing scheme.

¹⁵² Daily & Barrier, *supra* note 150, at 242-43.

¹⁵³ *Id.*

¹⁵⁴ "window" is acreage in the oil and gas field that is not included in an established drilling unit. If such acreage was smaller than the drilling units prescribed by the field rules, an off-pattern drilling unit, with a reduced well allowable, would be required to avoid a takings claim under Arkansas or federal due process constitutional provisions. The policy of avoiding "windows" was part of the motivation of AOGC's refusal to cross section lines in configuring drilling units.

¹⁵⁵ Ryan, *supra* note 150, at 7.

¹⁵⁶ In the earlier formative period of the Arkansas Conservation Act, oil and gas deposits in Arkansas were thought to underlay the subsurface in a "blanket" fashion. Modern theory is that subsurface hydrocarbons mainly lie within prehistoric river channels. Daily & Barrier, *supra* note 150, at 243. In northern Arkansas most gas deposits were deltaic river channels. *Id.* at n. 193.

¹⁵⁷ Ryan, *supra* note 150, at 1, 7-8.

¹⁵⁸ *Id.* at 7, 8, 11-12.

¹⁵⁹ *In re Peppers Ref. Co.*, 272 P.2d 416 (Okla. 1954). The Oklahoma Supreme Court opined in Peppers as follows:

To hold that the Commission could never modify a well-spacing pattern established by a previous order not appealed from, upon a showing of characteristics about a common source of supply, and the withdrawals therefrom, that were not known or anticipated at the time of the original order, would "tie the hands" of the Commission and often prevent it from performing its statutory duties under our Oil and Gas Conservation Act. *Id.* at 424.

¹⁶⁰ Daily, *supra* note 150, at 243.

¹⁶¹ Act 964 of March 31, 2003, 2003 Ark. Acts 964, (codified at ARK. CODE ANN. § 15-72-302(b)(2)(A) and (B) (i)(ii), (Supp. 2009)), amended Act 105 to define a drilling unit and the AOGC's regulatory authority as follows:

(A) As used in this subchapter, "drilling unit" means a single governmental section or the equivalent unless a larger or smaller area is requested by an owner, as defined in [Arkansas Code Annotated section] 15-72-102, within the drilling unit to be established and a larger or smaller area is established by order of the commission. The drilling unit shall constitute a developed unit as long as a well is located thereon that is capable of

producing oil or gas in paying quantities.

(B) The commission shall have the continuing authority to:

(i) Designate the number of wells that may be drilled and produced within a drilling unit; and

(ii) Regulate the spacing among multiple wells drilled and produced within a drilling unit.

¹⁶² *Id* § 15-72-302(b)(2)(B)(i)-(ii).

¹⁶³ Daily & BaTier, *supra* note 150, at 244. The authors further note that "[s]ometimes this will involve a single well for each separate reservoir within the unit. Other times, the AOGC will find the necessity for multiple unit wells within single tight reservoirs." *Id*

¹⁶⁴ Rule B-43(c) provides that spacing rules are applicable to all "conventional and unconventional sources of supply in Arkansas, Cleburne, Conway, Cross, Faulkner, Independence, Jackson, Lee, Lonoke, Monroe, Phillips, Prairie, St. Francis, Van Buren, White and Woodruff Counties, Arkansas." ARK. OIL & GAS COMM'N, GENERAL RULES & REGULATIONS, *supra* note 135, at B-43(c).

¹⁶⁵ *Id* at B-43(f)

¹⁶⁶ *Id* at B-43(i)(4)

¹⁶⁷ *Id* at B-43(i)(3)

¹⁶⁸ *Id* at B-43(i)(4)

¹⁶⁹ *Id* at B-43(i)(2)

¹⁷⁰ *Id* at B-43(i)(5)

¹⁷¹ *Id* at B-43(a)(2)(C)

¹⁷² "These cylinders are then laid side by side and/or end to end in patterns that accomplish remarkably effective and cost-efficient drainage while, at the same time, reducing surface impact." Thomas A. Daily and W. Christopher Barrier, *supra* note 150, at 244.

¹⁷³ ARK. OIL & GAS COMM'N, GENERAL RULES & REGULATIONS, *supra* note 135, at B-43(0).

¹⁷⁴ ARK. OIL & GAS COMM'N, GENERAL RULES & REGULATIONS, *supra* note 59, at B-43(0)(1).

¹⁷⁵ *Id* at B-43(o)(1)(A)-(B).

¹⁷⁶ *Id* at B-43(0)(I)(A). The "half circle" drawn at the beginning and ending of the perforated horizontal well bore is a modification for horizontal wells of the theory of radial drainage, inherent in the doctrine of compensatory drainage, applied to traditional vertical wells.

¹⁷⁷ Tex. Nat. Res. Code Ann. § 102.011 (Vernon 1978).

¹⁷⁸ Ark. Code Ann. § 15-72-303(b)

¹⁷⁹ Ark. Code Ann. § 17-72-304(a); Thomas A. Daily, *Lawyeri ng the Fayetteville Shale Play —Welcome to my World*, 44 Ark. Lawyer 10, 11 (2009).

¹⁸⁰ Thomas A. Daily, *Supra* N. 179 at 11; Ark. Code Ann. § 17-72-304(b)(4).

¹⁸¹ 1 Eugene Kunta, *Supra* N. 4 at § 5.6.

¹⁸² Act 536 of March 20, 1963, 1963 Acts of Ark. 1648.

¹⁸³ Ark. Code Ann. § 15-72-303(b).

¹⁸⁴ Ark. Code Ann. § 15-72-304(b)(1) (1994).

¹⁸⁵ *Id* § 15-72-304(b)(2).

¹⁸⁶ See generally Ark. Code Ann. § 15-72-304; Ark. Opil & Gas Comm'n. General Rules & Regulations B-43(g)-(h) (2009),¹ available at [http://www.aogc.state.ar.us/Online Data/Fonns/Rules](http://www.aogc.state.ar.us/OnlineData/Fonns/Rules).

¹⁸⁷ *Id* § 15-72-304(b)(4), (d).

¹⁸⁸ Ark. Code Ann. § 15-72-304(b)(3); see Thomas A. Daily. supra note 179. at 41. (Check daily)

¹⁸⁹ See ARK. CODE ANN. § 15-72-304(b)(4); Thomas A. Daily, *supra* note! 79, at 41.

¹⁹⁰ Thomas A. Daily, *supra* note 7, at 41 ; see also ARK. CODE ANN. § 15-72-304(b)(4).

¹⁹¹ Thomas A. Daily, *supra* note 179, at 42 n. 19

¹⁹² "Payout is that point where the other 7/8 of revenue equals the amount of all drilling completion and equipment costs, multiplied by the *riskfi:ltorpenalty* plus 100% of subsequent operating expenses." *Id* at 42 n.20 (emphasis in original).

¹⁹³ Ark. Code Ann. 15-72-304(b)(4r), (d).

¹⁹⁴ Thomas A. Daily, *supra* note 7, at 41.

¹⁹⁵ ARK. CODE ANN. § 15-72-304(b)(4)

¹⁹⁶ Thomas A. Daily, *supra* note 7, at 41

¹⁹⁷ ARK. CODE ANN. § 15-72-305(b) (Supp. 2009).

¹⁹⁸ *Id* .

¹⁹⁹ See 3 KUNTZ, *supra* note 55, § 42.5(f), at 418

²⁰⁰ 218 Ark. 160, 235 S.W.2d 33 (1950), Reh'g denied, January 22, 1951.

²⁰¹ Act 134 of 1951 rest of the cite, codified at 15-72-308 et seq.

²⁰² 15-72-309 (a)(j).

²⁰³ *Id.* at (A)(2).

²⁰⁴ *Id.* at (a)(3).

²⁰⁵ § 15-72-310

²⁰⁶ *Id.* at 310(2).

²⁰⁷ *Id.*

²⁰⁸ Bruce E. Kramer and Patrick H. Mailin, *supra* N. 39 at § 2.03(1]. The discussion of the Shuler Field secondary recovery operations is taken from Kaveler, "Engineering Features of the Shuler Field & Unit Operations." 155 AIME Transactions 55-85 (1944)

²⁰⁹ U.S. Energy Information Administration, Rankings: Natural Gas Production, 2013, www.eia.gov/state/rankings/#/series/47.

²¹⁰ J. Scott Parker, *Supra*. N. 13 at 34

²¹¹ *Id.* At 34.

²¹² O.C. Bailey, Oil and Gas Resources of Arkansas, *The Southern Conservationist*, p. 8 (Oct. 1938).

²¹³ Alec M. Crowell, *Supra*. N. 82 at 26.